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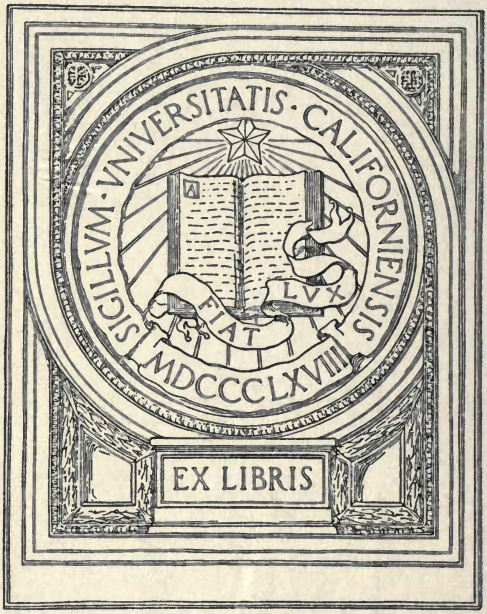
GIFT OF
Harry East Miller



Glacier Garden
Lucerne

Glacier Garden

LUCERNE

1913

LUCERNE
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Q105
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Gift of
Harry East Miller

Attestation*)

In the autumn of 1872, Mr. Amrein-Troller was having a cellar dug in the proximity of the monument of the Lion at Lucerne. After having removed a stratum of arable earth, several feet in thickness, and another layer of shingles, the workmen struck upon the firm grey rock of the country, in which were sunk many deep excavations, caldron-shaped, at the bottom of which lay large round blocks of Alpine rock. I was called in to examine the nature of the surface, which was soon to be destroyed by further digging and blasting. Along the sides of this first **Glacier Mill,** sev eral more were discovered.

Encouraged by competent men, the owner determined not to destroy the rock, but rather to embellish it by plantations, and so to render it accessible to such as felt an interest in these wonderful natural phenomena.

There can be no doubt that these caldron-looking excavations owe their origin to the action of erosions at the foot of cascades. The rounded boulders, seen at the bottom of the mills, have been whirled about by water and have polished the mills by friction. It is in vain we look for the cliffs from which the water must have fallen in a torrent upon the surface of the rock; but what we do notice is that this surface is furrowed and scratched between the mills, as only glaciers can belabour their rocky beds. The boulders that lay in the mills are **erratic,** i. e. have been dragged to this place, by the glaciers of an epoch long past, from the innermost parts of the Alps. Many of them, which were before the excavations, covered with layers of detritus and of arable land, show the characteristic furrows and scratches of the stone blocks which are caught between glacier and rock, and have been polished by the slow, forward progress of the former. The holes in Lucerne have, incontestably, been hollowed out by the torrents of melted snow that dashed down the steep end of the formerly mighty glacier, or rushed through the ice-crevices down to the ground, and the now-disappeared cliff was glacier-ice. It

*) We place this attestation at the head of our little work, for the reason that every year some visitors of the Glacier-Garden seem still to have a wrong idea of the discovery of the Glacier pots (or mills).

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was in those long-by-gone days, when the glaciers were descending form the Alps, and had extended as far even as the Jura mountains, that the mills of the Glacier Garden were formed. The Giant Pots were filled by the moraines from a glacier giving way under the effect of a warmer climate, and the detritus brought down by the torrent, and have remained thus hidden till they were exposed to view in the autumn of 1872.

Similar discoveries have been made, as is well known, in Scandinavia, and in other parts of Switzerland; but the glacier-mills in Lucerne surpass any of those by the perfection of their forms and the distinctness of the phenomenon. To meet the doubts expressed by some visitors, whether man's hand had not assisted nature, I hereby testify both as a geologist and as an eye-witness of the first unexpected discovery, as also of the subsequent careful excavations of this so wonderful phenomenon, that **the hand of man had nothing whatever to do with the formation of these glacier-mills, and polished surface of the glacier, nor with the erratic boulders that lie about or in those mills, but that we have here to deal with a marvelous operation of free organic nature**, a relic of a time when these countries were not yet inhabited by man.

Zürich, 1876.

Albert Heim,

Professor of Geology at the Federal Polytechnic School and at the University in Zürich.

Glacier Garden, Lucerne
(Gletschergarten).

A.
Explanation of the Geological Part of the Glacier Garden

by Dr. **Albert Heim**
Professor of Geology at the University and Polytechnic School of Zürich.

1—11. These are remains dating from the period of the glaciers, a period in the history of our globe, which takes us back far beyond the oldest traditions and historical records. **In those days, almost the whole of Switzerland and indeed the greatest part of the northern hemisphere were buried under immense masses of ice, as geologists can now prove with the greatest certainty, with here and there an oasis inhabited by animals long ago extinct. Before that time we have a period when ocean covered the land, and an age when half-tropical heat produced tropical forests in Switzerland.**

Up to the year **1872** these marvels of nature lay still hidden under the detritus (moraines) carried along, centuries ago, by the moving **Reuss Glacier,** and **under the humus** (soil) **of a green meadow.**

A mere **chance** (see page 6) led to the **discovery** of a **Glacier-hole.** Researches were then continued till the year 1875 and, after the moraine or detritus had all been removed, wonderful **erosions** made by nature were discovered, as well as **petrifactions** of tropical animals and plants, which the visitor will best inspect in the following order:

No. 1 is one of the gigantic **Pots** or **Glacier-holes,** with erosions caused by the glacier. They owe their exist-

View of the premises **before** the excavations in October 1872.

ence to the whirling of stones driven round and round by the force of melted ice. In geology these holes or pots are known by the name of **Glacier-mills.** The stones, whirled round by the water, ground the rock, and at the same time polished themselves, as the two samples of **Mill-stones** lying in this **Mill** amply prove.

No. 2 is a **Glacier-mill** with two **Grinders** left; most of them have been removed in order not to impede the inspection of the mill. The spiral windings, worn by the immense force of the water, falling from a great height of the glacier and whirling round from East to West, are clearly visible.

No. 3 is the **Mill** that was **first** discovered of all, and had the sad fate of being almost destroyed, the value of the interesting discovery not being yet known.

No. 4 is a layer of **Rocks** abounding with **fossils** of **sea shells,** showing that the **whole country** situated at the **foot** of the **Alps** was once **covered** by **the sea.**

No. 5 shows the **petrifaction** of a palm leaf discovered by the breaking of a stone near the Garden.

On this small spot of ground you have, therefore, before your eyes different pages of the history of our earth; for the country where we are now, once presented various aspects: No. 4 dates from the period when the ocean covered the land, No. 5 represents the period when tropical heat produced tropical forests; in the Glacier-Mills we have the debris left by the ice that once covered all the Northern hemisphere. Thus the aspect of the earth was changed in the course of millions of years.

No. 6 is another **Glacier-mill** the border of which has been slightly injured. Its spiral windings, however, are very distinct. There are two Mill-stones, one appears to have formed a complete circle, the other a half-circle.

No. 7. A **mighty mill-stone** (110 Cwt), that was excavated in the year 1875 out of the depths of No. 11, the largest glacier-pot.

Close by are to be seen large **Blocks** carried away from the **Alps** and left here by the **moving Glacier.** The whole surface of these boulders is furrowed by **scratches** which always appear on stones that have been carried down by a Glacier. They prove, that **these stones were moved on by glaciers** and **not** by **torrents.**

No. 8 shows an area full of **grindings, furrows** and **scratches** made by the **Glacier** of the **Reuss,** under which the rocks were, as it moved along. The indentations displayed were caused by the sharp edges of the boulders which the Glacier dragged along in its course.

No. 9. Various smaller and larger **beginnings** of such **Mills.**

No. 10 is a Glacier-Mill with a big **Mill-stone** of **Granite** from the **Gotthard.**

No. 11 is the finest and largest Glacier-Mill that has ever been found. The mould covering it was removed in **1875—1876.** The diameter of the Mill is **26′ 25″**, its depth **29′ 53″**. At the bottom several holes of **Mills** between the crevasses of the rock will be perceived. — Leaving this grand workshop of nature we enter into the **Relief Gallery.**

B.

No. 12. The old model of the Muota valley near Brunnen on the lake of the IV Cantons, **representing the battles which took place there between the Russians and the French on October 1st, 1799.***)

Though not belonging to the scientific part of natural history, this model interests all the visitors of the Glacier Garden thanks to its faithful reproduction of the romantic Muota valley and of the positions occupied by the Russian and French armies on the 1st of Oct. 1799.

The following is a short account of this memorable day.

General Souvoroff's victorious army having crossed the

Marks of Grinding on the Rocks.

St. Gotthard, arrived in **Flüelen** to find that the enemy had done away with all the boats, thus compelling them to take once more to the mountains; there they were obliged to cross the **Kinzigkulm pass,** the Axen road along the lake not being yet constructed. The passage over the Alps lasted three days and three nights. Early on Sept. 28th Souvoroff arrived in the **Muota valley** and was informed, by the abbess of the cloister, of the fall of Zurich, and of the Austrians' hasty retreat from Switzerland. Most unwillingly Souvoroff resolved to make his troops retreat over the **Pragel.** His rear-guard arrived in the night of the 29th-30th Sept. into the valley of the Muota.

Meanwhile some **French** troops occupying the **entrance** of the valley, attacked the Russians at daybreak on the 1st of October. The Russians resisted for a long time, but **General Lecourbe's** army appeared suddenly in the direction of **Brunnen,** and **threatened to cut off** the Russians.

They were obliged to withdraw behind the bridge. In the **Grossmatt,** before coming to the **church** and the **cloister,** Rosenberg placed his starving troops for the decisive battle. At the risk of their lives the Cossacks ventured into the waves of the high swollen Muota, and the cavalry of both sides charged each other with terrible violence. A frightful slaughter followed, but the impetuosity of the Russians, that bordered on despair, conquered in the end. **Our model illustrates this part of the battle.** Step by step the French were obliged to yield. In vain do the officers attempt to restore order, and to renew the fray. Disorder sets in among the ranks of the French, and all flee in the utmost confusion towards the end of the valley. Resistance against the war-like courage of the Russians was no longer possible. The warmly contested stronghold was at last taken and the **Russian flag** planted thereon. With this Russian feat of arms the utter defeat of the French was completed. Henceforth their impetuous flight took a terrible form. A powder waggon stopped the small entrance to the bridge. The fleeing masses pressed ever harder and harder on the now partly repaired bridge, which the Russians had burnt after their retreat in the morning. On this shaky bridge the fugitives and the fresh reinforcements from **Massena** met. The shock was terrible. Cannons, waggons full of wounded men and horses were hurled in great numbers into the roaring waves of the Muota, down into the dreadful abyss. Already a half-brigade had thrown down their weapons, when, with the approching night, general Lecourbe came from Brunnen with a second division of his brigade and the Russians withdrew into the ravines of the mountain-

The finest and **largest Glacier mill** that has ever been found.
Diameter 26'25'', depth 29,53''.

valley. Lecourbe after learning the fate of the French army, gave up all further pursuit of the Russians. On this bloody field the French lost over one thousand men killed and wounded, besides all those who were taken prisoners.

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*) The person to whom we owe this model was a young man called Niederöst from Schwyz, who was later artillery captain in the French service. Niederöst when twenty-one had watched the bloody battle between the two armies from the heights of Illgau. The sight made so deep an impression upon him that he determined to represent it by a model. In two years (1800—1802) the work was completed. Owing to the fidelity with which the valley of the Muota is rendered, as well as the position of the belligerent armies on the day of the battle, October 1st, it will ever remain a precious picture of the history of that time, and rouses, in military circles especially, the liveliest sympathy for the details of the remarkable mountain war it illustrates. The localities are, with great truth, worked out on a scale of 27,273/11. This model was bought as pendant to that of the late General Pfyffer, the oldest model of Central Switzerland. Under the direction of Colonel Bindschädler of Lucerne, together with his aide-de-camp, it was renewed in 1894, particular attention being paid to the positions of the fighting armies.

For the convenience of the visitors of the Glacier Garden is here to be found an entrance to the

Labyrinth: *This is a Moorish Palace built after the celebrated Alhambra in Granada. Through the magnificent galleries and palm corridors with their interesting groups we find our way to the lion court-yard, where we pass to the entrance of the Kaleidoscope with its wonderfulilluminatoins andreflections.*

A visit to the Labyrinth is very amusing and should not be missed.

Prehistorical Period.

The most ancient Vestiges of Man.

Since the days when the naturalist Cuvier († 1832) wrote these words: „l'homme fossile n'existait pas", ideas on the subject have altered considerably. To-day we

know that Europe was already inhabited by men in the days of the mammoth and of the diluvial ice period. The very successful prehistorical researches endeavoured to find the most ancient vestiges of mankind. In many places there have been found either remains of a man's skeleton in a fossil state, or other proofs of their existence, implements, traces of their culture, &c. It is not quite possible to fix exactly the age of mankind. From the most recent inferences of Penck, the beginning of the diluvial period is admitted to have taken place about 500,000 years ago. The diluvial man was acquainted with the use of fire, employed tools made artificially of bones or flint. We observe cases of burial of the dead that show a commencement of ethical and religious life. In the second half of the diluvial epoch these men gave practical proofs of their interest in art. On the ceilings and walls of their favourite dwelling places, the rocky caverns, they drew and painted pictures of animals. In the first half of the diluvial period we find rather ancient remains of a race of men to-day entirely extinct, the so-called **Neandertal race.** Towards the end of the ice period there seem to have been in Europe only one single race of men who carried on the culture of the time, and who resembled as to the form of their bodies the present living race. These men survived the fast disappearing great cold period. In their time already the mammoth, the most characteristic animal of the European ice period, seems to have vanished more and more. The reindeer was as far down as the south of France, the wild animal chiefly hunted.

The idea, that the man of the present day, like all other living beings of creation, has originated by a harmonious development, is made clear by the skulls and bones that have been found, the casts of which are to be seen in the museum, **No. 13.**

We distinguish the following stages:

	Age:
I. Stage. Most primitive race of man. Remains of the ancient primitive man:	Beginning of the ice period and first middle period

II. Stage. The Neandertal race (homo neandertalensis):	Middiluvial, up to the last middle ice period
III. Stage. The advanced Aurignac race (homo aurignacensis):	End of the ice period
IV. Stage. Highest primitive man race (reindeer-hunter, homo des Magdalenien):	The period after the ice period
V. Stage. Man of the present time. The now living European:	Present time

For comparison: the present race of people standing on the lowest degree of culture (Australians). They still show a few characteristics of the Neandertaliens (receding forehead, prominent jaw), in other ways they have further developed themselves.

No. 14. Lake-dwellings, after Dr. Ferd. Keller.

The objects that have been discovered take us back to an epoch, when the climate became gradually mild and pleasant as it is now-a-days. Our plants, corn, and fruit-trees spring up, whilst the reindeer, mammouth, rhinoceros vanish. After the men of the caves, belonging to the hunting period, come the inhabitants of the huts who cultivate the land.

The men of those remote times did not, however, live like those of the present time. Their habitations were mostly constructed above the water, on the lakes. These are the **lake-dwellings** and give their name to the whole time previous to the age of civilisation. Those lake-dwellings have not been known to us very long. **It was while digging, at low water, in the lake of Zurich in the winter 1853—1854, that unexpected light was thrown** on the science of these dwellings. In two different places at Obermeilen, to the great astonishment of the workmen, there appeared the tops of stakes and a great number of stag-horns (of Cervus elephas) and of various tools in stone, horn &c. Dr. Ferd. Keller of Zurich who has been, for the last twenty years, making researches, and studying the prehistorical time with the help of antiquities, went to Meilen, and at once felt convinced that the discovered objects were the work of that people who had lived in the country centuries before the beginning of our era, and even before the time of the

Glacier Mill with mill stones.

Roman domination: the Celts. In a short time there were, not only in the lakes of Switzerland, but also in Italy, France, the south of Germany and Austria, lake-dwellings discovered. The suppositions of Keller, as to the manner of living and origin of this people, were confirmed in every direction and in a marvelous manner. There have been found in Switzerland about 250 such lake-villages, differing as much in size as the villages of the present day. Thus this strange history of remote times lies pretty clear and unveiled before us. **The model** before our eyes **of a lacustrian settlement** has been constructed after the **researches and discoveries of Keller,** the father of Swiss modern researches of antiquities. At some distance from the shore of the lake we observe, above the water, some square, low huts, with gabled roofs made of plaited work, clay and straw, built on an extentive wooden structure. A long narrow path connects this wooden island with the mainland. The necessity of protecting their own persons against their enemies, or wild animals, may have been the principal cause of this way of building. It offered also great advantages for fishing. A great number of fish, drawn hither by the refuse, collected no doubt around these habitations and were then easily caught. The lakes offered also much better means of communication than the large, primitive forests that covered the country and rendered settlements and traffic so much more difficult. What a busy life reigns on these lake-dwellings! There we see fishermen standing with their nets and rods angling for fish, or rowing about in their canoes made of hollowed-out trunks and watching for their prey. Some are spinning and weaving before the house, while others are hammering and making all sorts of tools and implements. The children are playing, and some men, returning from hunting, carry, on a strong pole, the game they have killed.

Arranged round our model may be seen some genuine **flint or horn tools,** such as hatchets, chisels, with fragments of their handles, together with pins, and **charcoaled remnants of fishing nets, plaitings, thread** and **cords,** all of them articles of such perfection and finish, that no

one could take them to be the products of such remote ages, if they had not really been found among the remains of these dwellings.

We find in the cabinet against the wall a fine collection, being part of that belonging to the late Mr. C. C. Amrein-Buhler, professor in St. Gallen († 1898), and consisting of about 140 instruments of stone, 6 of wood, 66 of bone, moreover about 190 objects or rather characteristic fragments of earthenware, divers fruits, leather, and a number of teeth, bones, antlers and horns of animals. Most of these objects were found by Professor Amrein himself during the autumn and winter 1872—1873 at the northern extremity of the lake of **Baldegg**. The spot where these lacustrian remains were found, from 2—3 acres in size, is situated on a tongue of land, stretching a good way into the lake; it was formerly entirely, and is even now-a-days partly, under water. It is bordered in the East and North by the hillocks formed by the moraines of that glacier to which we owe the origin of the mill-pots of this garden.

We specially mention:

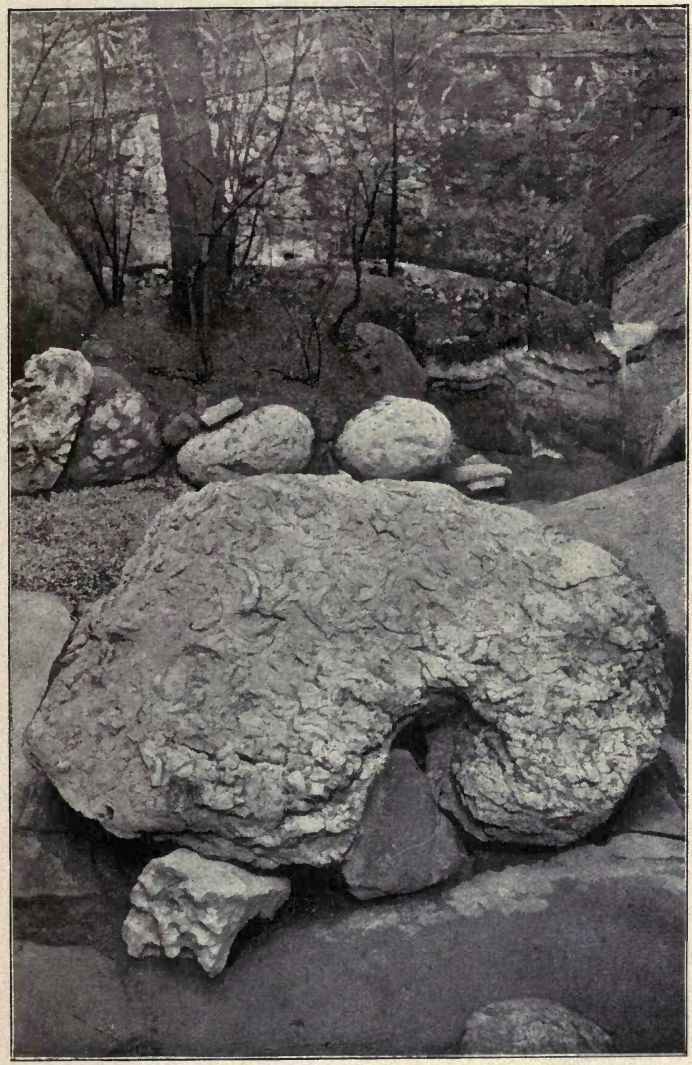
1. Heads of lances of silex. 2. Agate. 3. Heads of lances of rock crystal. 4. **Chisels** and saws of silex. 5. Silex. 6. **Hatchets** of flint-stone and green-stone. 7. **Pickaxe** and **hammer** made of flint-stone and green-stone. 8. **Pickaxe** and chisel of flint stone (very rare). 9. **Chisels** of flint stone, agate, green-stone, and green porphyry, etc. 10. **Gneiss**. 11. **Knife** of saussurite or nephrite. 12. Sand-stone to polish bone-needles. 13. Unknown. 14. **Sling-stone**. 15. Sand-stone to polish bone-instruments. 16. Stone to iron leather with. 17—18. Stones of different size to stretch out the weaving. 19. **Driving-mallets**. 20. **Whet-stones** of very fine sand-stone used for the preparation of stone hatchets, stone-chisels and instruments of bone. 21. **Grinding-stone** with under-mill-stone. (This is the origin of our corn-mill.) 22. About 60 pots herds of divers earthenware. 23. **Fragments** of earthenware, utensils with pretty decorations (finger-impressions), divers handles with **eyes**. 24—25. **Earthen**

plummet or **sounding-lead** for fishing nets. 26. **A whole earthenware vessel.** 27. A net-bearer of wood with hole. 28. **Lancet-like instrument** of wood, bent since it got dried up. 29. **Hammer-handle,** dried up. 30. Small pieces of untanned, thick leather. 31. **Carbonised wheat.** 32. Hazelnuts and an acorn. 33. **Carbonised half of an apple.** 34. Small elliptical plate. 35. Heads of lances of bone, different sizes. 36. Hand-hatchet of bone 37. Stone hatchet of bone. 38. Petrificated reindeer horns, with mark of the owner. 39. Shuttle with a small opening used for weaving-work or net-knitting. 40. **Knife of bone.** 41—42. **Shovel** of bone. 43. Knife of reindeer horn, with mark of the owner. 44. Knife of bone, in the shape of a dagger and in a good state of preservation. 45. Knife of bone with a setting of deer's horn. 46. **Tumbler** of horn. 47. Green-stone chisel with setting of stag's horn. 48. Stone-chisel of flint-stone with setting of stag's horn. 49. **Chisel** of flint-stone with setting of stag's horn. 50. **Chisel** of silex with setting of stag's horn. 51. **Shovel** of stag horn. 52. Hand-hatchet of a reindeer horn. 53. Lances of horn. 54. **Awls,** spiral-formed. 55. **Chisel** of bone. 56 **Dagger** of horn polished. 57. **Awls,** lancet-shapen and round. 58 Heads of bolts of bone. 59. **Needles.** 60—61. **Awls.** 62. Sewing-needle made of a bird's-bone. 63. **Chisel** of bone, polished. 64. Bird's head used as tumbler. 65. Teeth of unknown animals. 66. **Boars' teeth.** 67. Shuttle made of a bear's tooth. 68. Sawing-instrument made of a tooth (petrificated). 69—72. Ornaments of bone, stone and horn.

The rest of the dicoveries are: stag's and deer's horns; teeth of moor hogs, cows, stags etc. and bones of the following animals: a) Stag; b) roe or goat; c) eland antilopes; d) hog; e) bear; f) badger; g) beaver; h) common ox; i) sheep; k) goat; l) horse; m) domestic dog.

Nr. 15a. Bones of a stag (cervus elaphus) found in the moor of Wauwyl (Canton of Lucerne), April 1882, under a stratum (m 1.80) of arable earth (humus) and turf and another layer of chalk (m 0,45).

Nr. 15b. Prehistoric excavations in the valley of Vézère (Dordogne, France) by O. Hauser.



Rocks abounding with **fossils** of **seashells,** showing that the **whole country** situated at the **foot of the Alps** was once **covered** by the **sea.**

Cast of a skeleton from the diluvian times. The original is to be found in the Palaeozoic Museum at Berlin. (According to Penck's latest researches, the diluvian epoch can be reckoned to have begun about 500,000 years ago.) This skeleton, the Homo Mousteriensis Hauseri, was discovered in the presence of Hauser, professor Klaatsch and a few other German scholars in the summer of 1908, near Le Moustier, in the Vézère valley, Dordogne. It looks as if it had been regularly buried, a fact unknown, up to this discovery, among the primitive people of the Palaeolithikum. It lay in a sleeping posture, its head with the right cheek resting on its right arm, whilst the left lay stretched alongside. The elbow and head were resting on a heap of small flints, arranged so as to form a kind of pillow. Near it, were found a finely-worked wedge (Faust-Keil) almond-shape, of the "Acheul" type, and a kind of round-scraper (Rundschaber) of the "Moustier" type. There were also, scattered about, the remains of some half-calcined bones of animals, so of the "Box primigenius". This skeleton can be, with some certainty, considered to be that of a young man, about 16—18 years of age, measuring about 5 feet in length. It bears all the characteristics of the "Neandertal" race, the very clumsy long bones, the strongly curved radii, such as are never to be found among the modern human races. The skull is very characteristic too, with its huge orbits, its flat forehead and the snout formation of its jaws. To this be added the strongly protruding frontal bone, typical of all the skulls of the "Neandertal" race. These men must have been excellent hunters and keen observers.

Kesslerloch and Schweizersbild were held, till lately, to be the most ancient prehistoric places of culture of Switzerland. They belong to the period of the reindeer and mammoth hunter (Magdalenien). In the caves of the **Wildkirchli** in the mountains of Säntis (1477 m above sea-level), were found the proofs of a still more ancient human settlement. Beside an enormous quantity of remains of the cavern bear (Ursus spelaeus), that had

become extinct before the reindeer period, as also some of the cavern lion (Felis spelaea), of the cavern panther (Felis pardus var. spelaea), and of a great number of other Alpine animals (wild goat, bouquetin, wolf, chamois &c.), there were found numerous stone instruments of a very primitive form (type of the ancient or primitive Moustérien). Real flint after the French fashion are not found. The primitive man fetched the material out of the valley of the Weissbach, situated about 300 meters deeper; he must also have made an exchange of tools. The cavern-bear-hunter of the Wildkirchli was so far advanced that he also made some tools of bones (the oldest in Europe). See the photographs of some stone and bone tools from Wildkirchli.

No. 15 c. The settlementof the Wildkirchli belongs to the last middle ice period (Riss-Würm-Interglaziale after Prof. Dr. Albrecht-Penck, Berlin). The original objects found in that place are to be seen in the Home-museum of the town of St. Gall

Literatur: 1. Emil Bächler: Die prähistorische Kulturstätte in der Wildkirchli-Ebenalphöhle.
Berichte der Schweiz. Naturforschenden Gesellschaft 1906.

2. Emil Bächler: **Das Wildkirchli,** die älteste prähistorische Kulturstation der Schweiz und ihre Beziehungen zu den altsteinzeitlichen Niederlassungen der Menschen in Europa.
Schriften des Vereins für Geschichte des Bodensees und Umgebung, Heft XLI, 1912.

C.

Groups of Swiss Alpine Animals

			Place where shot:
No.	1.	Lutra vulgaris. Common otters	Berne, Aare
„	2.	Canis vulpes. Foxes lying in wait of rock ptarmigans	Pilatus

„	3.	Pandion haliaëtus. Linné, Osprey	—
„	4.	Aquila pomarina. Chr. L. Brehm, Roughfooted eagle	Bernese Oberland
	5.	Haliaëtus albicilla. Linné, White-tailed sea eagle . .	Berne, Aare
„	6.	Aquila fulva, Tawny eagle	—
„	7.	Caccabis saxatilis. Rock ptarmigans	Pilatus
„	8.	Canis vulpes. Foxes with young ones	Lucerne
„	9.	Felis lynx. Lynx	Valais
„	10.	Buteo buteo. Linné, common buzzard	—
„	11.	Buteo lagopus. Rough-footed buzzard	—
„	12.	Ursus. Group of bears . .	Grisons
„	13.	Aquila fulva. Tawny eagle and eyry	St. Gotthard
„	14.	Gypaëtus barbatus. Bearded vulture	$4^1/_2$ miles distant from Furka mountain
„	15.	Gyps fulvus. Tawny vulture	—
„	16.	Circaëtus gallicus. Same name	—
„	17.	Capra ibex. Common ibex .	Valais
„	18.	Capra hircus. Alpine ibex .	Valais
„	19.	Canis lupus. Group of wolves	Engadin and Tessin
„	20.	Sus scrofa. Wild boar . .	Argovie
„	21	Capreolus vulgaris. Group of roe-deer	Lucerne
No.	22.	Cervus dama. Group of fallow deer	Berne
„	23.	Lepus variabilis. Alpine hares, summer, winter, and spring coat	Pilatus
„	24.	Gordon setter.	—
„	25.	Milus regalis, Milan	—
„	6.	Aquila fulva. Tawny eagle	—
		To the left:	
„	26.	Lagopus mut. Snow ptarmigans, winter and summer coat	—
			Where shot:
„	27.	Tetrao bonasia. Hazel- hens	Pilatus
„	28.	Tetrao tetrix. Black grouse	—
„	29.	Tetrao urogallo tetrix s. medius. Black cock . . .	Pilatus
„	30.	Tetrao urogallus. Capercailzie with hens	Pilatus

„	31.	Phyrrhocorax graculus. Linné. Alpine crow	—
„	32.	Pyrrhocoran pyrrhocoran. Linné. Mountain chough .	—
„	33.	Corvus corax. Linné. Raven	—
„	34	Micropus velba. Swift Alpine martinet	Mayenwand Bernese Oberland
„	35.	Sciurus vulgaris. Common Squirrel	—
„	36.	Septem dormientes. Fat dormouse	—
„	37.	Mustela martes. Common marter	Meggen
„	38.	Putorius erminea. Ermine	Lucerne
„	39.	Putoius foetidus. Pole-cat	Lucerne
„	40	Meles vulgaris. Badgers .	Entlebuch
„	41.	Erinaceus europaeus. Linné. Hedge-hog	Lucerene
„	42.	Canis alpinus. St. Bernhard dog	—
„	43.	Capella rupicapra. Chamois	Lucerne
„	44.	Felis catus. Wild cats .	Grisons
„	45.	Arctomys marmota. Marmot	St. Gotthard
„	46.	Otis tarda. Linné. Great bustard	Berne
„	47.	Otis tetrax. Linné. Little bustard	Berne

GROUPS OF BIRDS

near the large window.

			Where shot:
No.	1.	Falco peregrinus, Linné. Peregrine falcon	Lucerne
No.	2.	Falco tinnuncul, Linné, Kestrel .	Lucerne
„	3.	Falco subuteo, Linné. Hobby . .	Berne
„	4.	Falco vespertinus, Linné. Red-footed falcon	Berne
„	5.	Accipiter nisus, Linné. Sparrow-hawk	Lucerne
„	6.	Astur palumbarius, Linné. Goshawk	Krauchtal
„	7.	Rallus aquaticus, Linné. Water-rail	Lucerne
„	8.	Crex crex, Linné. Corn crake .	Lucerne
„	9.	Coturnix coturnix, Linné. Quail .	Lucerne
„	10.	Syrrhaptes paradoxus, Pallas. Prairie hen	Berne
„	11.	Charadrius dubius, Scopoli. River-plover	—
„	12.	Charadrius pluvalis, Linné. Gold-plover, autumn plumage . . .	—
„	13.	Charadrius hiaticula, Linné. Sand-plover	—
„	14.	Oedicnemus oedicnemus, Linné. Thick-Koree	—

„ 15. Tringoides hypoleucus, Linné. Sandpiper . . . . . —
„ 16. Colymbus fluviatilis, Tunstall. Diver, winter plumage. . . . . —
„ 17. Vanellus vanellus, Linné. Lapwing —
„ 18. Fulica atra, Linné. Coot . . . . —
„ 19. Gallinula chloropus, Linné. Gallinules —
„ 20. Hydrochelidon nigra, Linné. Black water-swallow, summer plumage —
„ 21. Sterna hirundo, Linné. Sea-swallow —
„ 22. Alcedo ispida, Linné. King-fisher . Ct. Lucerne
„ 23. Oriolus oriolus, Linné. Oriole . . . —
„ 24. Picus viridis, Linné. Woodpecker —
„ 25. Dendrocopus mayor, Linné. Creeper —
„ 26. Nucifraga caryocatactes, Linné. Nutcracker . . . . . —
„ 27. Coracias garrula, Linné. Roller . .
„ 28. Garrulus glandarius, Linné. Common jay . . . . . —
„ 29. Pica pica, Linné. Magpie . . . . —

Groups of owls.

No. 31. Nyctala Tengmalim, Gmelin (same name).
„ 32. Strix flammea, Linné. Barn owls.
„ 33. Asio otus, Linné. Long-eared owl.
„ 34. Syrnium aluco, Linné. Hooting owl.
„ 35. Bubo bubo, Linné. Horned owl.
„ 36. Nyctea nyctea, Linné. Snowy owl.
„ 37. Glaucidium passerinum, Linné. Screech owl.
„ 38. Pisorhina scops, Linné. Little horned owl.

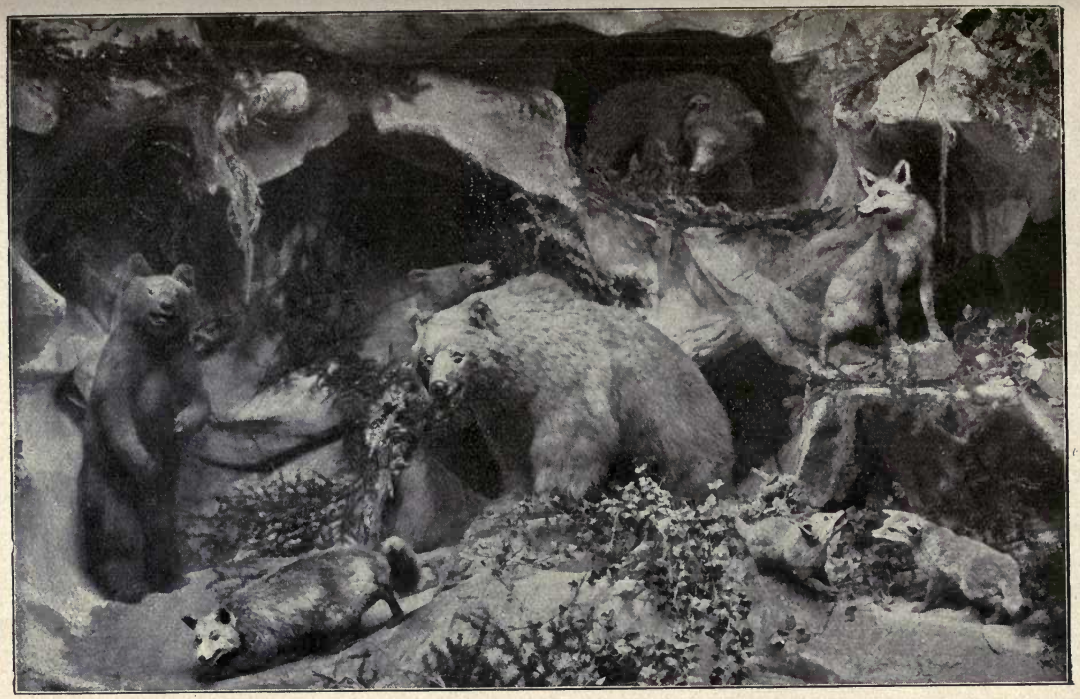
Marsh-birds.

To the left:
No. 51. Limosa lapponica, Linné. River-snipe, summer plumage.
„ 52. Numenius arquatus, Linné. Curlew.
„ 53. Tringa canutus. Sand piper, summer plumage.
„ 54. Totanus totanus, Linné. Tattler.
„ 55. Scolopax rusticula, Linné. Woodsnipe.
„ 56. Himantopus himantopus, Linné. Stilt.
„ 57. Haematopus Ostralegus, Linné. Oyster catcher.
„ 58. Recurvirosta avosetta, Linné. Avocet.
„ 59. Anas penelope, Linné. Wistling duck.
„ 60. Fuligula clangula, Linné. Long-tailed duck, young.
„ 60 a. Fuligula clangula, Linné. Male bird in his gaudiest plumage.
„ 61. Colymbus griseigena, Boddärt. Great northern diver.

Group of eagles in the Museum of the Glacier Garden.

„ 62. Fulica atra, Linné. Coot (black water hen).
„ 63. Tadoma tadoma, Linné. Brent-goose.
„ 64. Fuligula fuligula, Linné. Heron, male bird in his gaudiest plumage.
„ 64 a. Fuligula fuligula, Linné. Heron, female bird.
„ 65. Fuligula nyroca, Güldenstädt. Fen-duck in his gaudiest plumage.
„ 65 a. Fuligula nyroca, Güldenstädt. Fen-duck female bird.
„ 66. Fuligula ferina, Linné. Gray wigeon. Male bird in his gaudiest plumage.
„ 67. Anas acuta, Linné. Duck.
„ 68. Larus ridibundus, Linné. Laughing gull, young
„ 69. Larus argentatus, Brunnich. Silver gull.
„ 70. Spatula clypeata, Linné. Shoveller, male bird in his gaudiest plumage.
„ 71. Anas boshas, Linné. Wild duck, female bird.
„ 72. Mergus albellus, Linné. Little auk, male bird in his gaudiest plumage.
„ 73. Mergus merganser, Linné. Goosander, male bird in his best plumage.
„ 74. Ardea cinerea, Linné. Grey heron.
„ 75. Ciconia ciconia, Linné. White stork.
„ 76. Ciconia nigra, Linné. Black stork.
„ 77. Nycticorax nycticorax, Linné. Night heron, young.
„ 77 a. Nycticorax nycticorax, Linné. Night heron, old bird.
„ 78. Botaurus minutes, Linné. Little bittern.
„ 79. Botaurus stellaris, Linné. Great bittern, male bird.
„ 79 a. Botaurus stellaris, Linné. Great bittern, female bird.
„ 80. Colymbus cristatus, Linné. Crested Diver, in his best plumage.
No. 81. Urinator lumme, Gunner. Guillemot (North Sea diver), young.
„ 81 a. Urinator lumme, Gunner. Guillemot, old bird in autumn.
„ 82. Phalacocorax carbo, Linné. Cormorant, young.
„ 83. Phoenicopterus rosens, Pallas. Flamingo shot in Murten on their passage.

No. 16. This **celebrated model of the original Central Switzerland** comprises the greatest part of the cantons of Uri, Schwyz and Unterwalden, and almost the whole of the canton of Lucerne, together with the adjacent districts of the cantons of Berne, Aarau and Zurich. The late Lieutnant-General Ludwig Pfyffer of Wyher, of Lucerne (1716, † 1802), great commander of the order of S^{t} Louis of France, began in 1766 this astonishing



Group of bears in the Museum of the Glacier Garden.

work, after his **own measurements,** and completed it in the course of 19 years. It is made of **wax** and **gypse** and is composed of 136 pieces. — In the space of over 100 years the technic of model-making has made, it is true, much progress; nevertheless this relief of Pfyffer remains **the first** in Switzerland, and deserves still, on account of its accurateness, in a high degree, the great praise which Fuessli, in his history of art, has bestowed upon it.

The model measures 24 feet in length and $12^1/_2$ feet in breadth. The horizontal distances are on a scale of 1 : 12,500, the height of 1 : 10,000. Let it be also mentioned here that the relief has its natural geographical position; the town of Lucerne (438 m above the level of the Mediterranean) occupies almost the centre of the model. Any good map of central Switzerland gives the further explanation.

No. 17. **Panorama of the Rhinefalls** as seen from the "Schweizerhof" near Neuhausen.

From Spring to Autumn

Exhibition and sale

of works of Swiss Artists. Oil paintings, aquarelles, drawings, graphic designs.

No. 18. This modern **model of the Gotthard railway,** constructed in 1885 by Mes. X. Imfeld and F. Becker, civil-engineers and topographers, shows us the whole line of this railway from Lucerne to Locarno (scale 1:25,000) and gives us a very good idea of the difficulties that had to be overcome and contended with for its construction. The proportion of the height of the sundry mountains and snow-capped Alps that lie between is rendered with mathematical accuracy. The interesting paths across the Gotthard, the Furka &c. are a great help in guiding the tourist during his excursions in these parts.

No. 19. A Hall in gothic style and furniture to match; among other things let us notice: a stove

with relief tiles dating from the XVIth century. On the walls are paintings by Koller, the well-known Swiss animal-painter († Zürich 1903).

The broad staircase leads to the exhibition-rooms recently fitted up (1905/06), and to Alpine collections.

Division A. **Topography, geological cartography.**

The **Säntis-Relief** 1 : 5000, by Prof. Alb. Heim in Zürich.

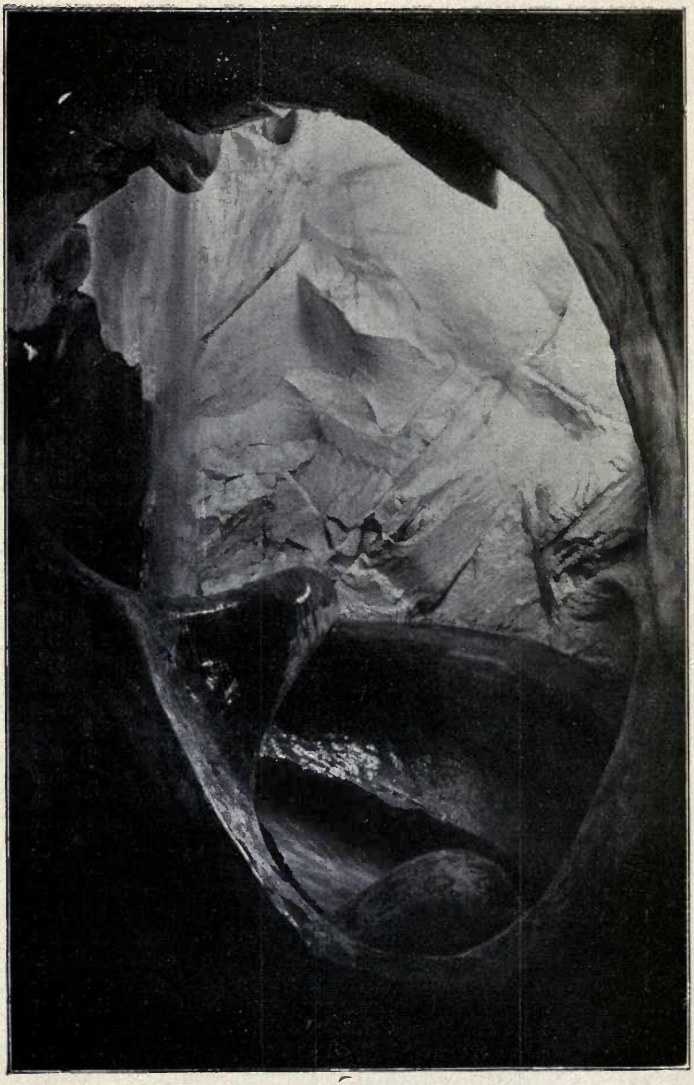
Whereas we have become acquainted, at No. 16, with the oldest Relief, the origin of which dates from 1766—1780, we are now standing before the youngest creation of this kind of technics with its eminent improvements.

Prof. Heim writes about it as follows:

The group of the Säntis is a cluster of steep folds formed by the strata or layers of the cretaceous system. As a group of folds it can serve as a typical example of a chain of mountains.

The most southern fold, extending throughout the relief is that of Gulmen. In its western part the upper chalk is worn, but the „schratten"chalk exists in the shape of a closed vault. A deep valley (Mulde) Teselalp-Rosenalp, separates the first vault from the adjacent western vault. The next northern valley appears in the Wildhaus Schafberg, and in the Querkamm of the Moor, and runs down into the deep basin of the lake of Fählen. The fourth vault rises in steep calcareous slabs out of the lake of Fählen, in the direction of the Hundstein. Its southern flank forms, in the „Schratten"chalk, the Altmann. The fifth vault, coming from the east, rises on the northern margin of the lake of Seealp. In the back-ground of the Seealp, we see it splendidly through an oblique opening, disclosed in the neocom-bend. It projects just below the summit of the Säntis, which is left standing on the top of the vault like a saddle-shaped bridge of the upper layer of chalk. Between the Säntis and the peak of Gire, the most beautiful fanshaped valley (Mulde) of the Sewer chalks is to be seen. Then follows the northern edge of the mountain, the complicated formation of the North Vault, that forms on its steep flanks the Silberblatt, the peak of Gire, Türme etc., in its back the Gartenalp, Ebenalp, Bommeralp.

A very great horizontal, transversal shifting is noticeable through the whole chain. Various and numerous are the hundreds of interesting technical details of this



Mill-stone in motion (No. 20.)

mountain: they are all to be found, as far as the scale allows, represented with their peculiarities in the relief.

For further illustrations we can consult the geological wall profile, the maps and photographs from nature in the exhibition rooms.

This relief, looked at through a telescope, and from a distance, has an extraordinary plastic effect.

Division B. **Mineralogy and Geology.**

1) Collection of 276 specimens of stones from the Swiss Alps, classified and grouped by Dr. C. Schmidt, professor of geology at the Basle university.

This collection is a capital illustration of the petrographic composition of the Swiss Alps. Sediment-stones, eruptive stones, and old crystalline slate, as well as metamorphised sediments have here found their proper appreciation.

The arrangement of the stones is very nearly that of the legend of the geological and synoptical table of Switzerland 1 : 500,000 (1894) by A. Heim and C. Schmidt, and is consequently strictly geological.

2) Collection of stones from the Mont-Blanc group in 80 specimens, according to the statement of Dr. L. Duparc, professor at the university of Geneva (author of a standard-work on Mont-Blanc); they were collected on the spot, and proved authentic in collaboration with Dr. Pearce.

(In the present collection are assembled all the most important types of stones, eruptive stones as well as sedimentary and cristalline stones and these give a perfect image of the metamorphosis accomplished by the pressure of the granite in the upper layers).

The place where each sort of stone has been found is indicated, with its number, in the geological map of the Mont-Blanc group (see Map on the eastern wall).

3) Collection of **stones from the Gotthard Tunnel** (1872—1881).

4) Collection of **stones from the Simplon Tunnel** (1898—1905).

5) **Geotectonic Models from the Alps** by Dr. F. Pearce in Geneva. These sections, laid normally in the direction

Swiss Chalet in the Glacier Garden.

glacier. As much as the scale of measure allowed the contrast of forms between the **torrent erosion** and the **glacier erosion** has been carefully rendered. The different phenomena are all represented in their right and mutual proportions of size and have not been exaggerated either as to color or form. The position is natural and therefore possible.

Those who have roamed among the glaciers will fancy they recognize everywhere well known spots. We strongly recommend to the visitor to examine the relief at a distance through a telescope or an opera-glass and to look at it from every point of view.

Division C. **Paleontology.**

Collection of **petrifactions** (fossils) **out of the sea sandstone of Lucerne and Central Switzerland,** collected by L. Kuisel of Lucerne.

The science of petrifactions is important, inasmuch as it gives a much-wanted complement to the materials for a history of organisms, and also as a help to geology, for defining the age of the different layers of stones. The rank of age, recognized by the stratification of the fossil organisms, allows, though it is still very defective or incomplete, to determine a constant change of the species, by which we can observe a gradual perfecting of the total organic character of the earth.

Divers geological special maps of Switzerland.

Division D. **Library** in gothic style, destined to receive works on the whole domain of natural sciences. Literature on the Swiss Alps and their scientific exploration, and on the origin and development of the Glacier Gardens.

Division E. **Swiss Alpine Flora,** a collection of the principal specimens of the Swiss Alpine Flora, with notices on the places where they are found, the nature of the soil, the altitude, etc.

The steps to the left lead you into the new rooms opened in 1913.

Protection of Nature in Switzerland and the Swiss National Park.

C. Schröter, Dr and Professor of botany at the Federal Technical Highschool in Zürich, writes on this subject:

A powerful movement seems of late to be stirring in every country. Men have come to the conclusion that it is high time to put a stop to the destroying work of the all-levelling culture, before the original face of mother Earth has become entirely unrecognizable.

Save, what can still be saved; create a refuge for animals and plants! This is the cry all over the world.

The problems to be resolved for this protection of nature are the following:

1. Preservation of interesting geological formations on the surface of the earth (erratic blocks, moraine districts, round protuberances, caves, rare minerals and stones, petrifactions).
2. Protection of our mountains, lakes, waterfalls against disfigurement, by too extensive or inconsiderate projected technical plans (orological and hydrological protection of nature).
3. Preservation of the vegetable kingdom: measures against the threatening impoverishment of the whole wild flora, but especially of the Alpine flora, by wholesale gathering or digging up, protection of rare plants, remarkable trees, whole primitive families of plants that are threatened with disappearance by culture (moors, heather, steppes, primeval forests).
4. Preservation of the wild animal kingdom by protective regulations, and by preserving, or creating again, favorable conditions of life.
5. Creating large continuous districts of refuge (reservations, national parks, preserves for animals and plants), where every possible encroachment of man is out of the question; these are the most effective and lasting measures for the preservation of primitive nature.

The following organs in this noble undertaking in Switzerland are: The Bird protection and ornithological Society, the Forest Society, the liga for home protection, the Swiss commission for the protection of nature, and the confederation for protection of nature. Everyone having a heart for such ideal efforts should enter the

Club-Clottage

The Lion Monument.

This famous master piece is dedicated to the memory of the Swiss guards of Lewis XVI. It represents in a touching manner their fidelity and bravery, when during the French revolution in 1792 they laid down their arms, by order of the king, and so fell a prey to the fury of the populace, as they retreated unarmed into the Tuileries. The model was made by the renowned Danish sculptor Thorwaldsen and was executed from 1819—1821 by L. Ahorn from Constance.

The Lion Monument.

The monument measures with the grotto 13 metres, the lion itself 9 metres. A large grotto is hewn into the natural sandstone and here rests carved out of the rock a dying lion of mighty forms and a most beautiful and touching expression. His body is pierced by a spear. Full of pain the noble animal has broken down, still protecting while dying the scutcheon of the Bourbons. Above the monument can be read carved into the rock the words, "To the fidelity and bravery of the Swiss", beneath it the names of the 26 officers who fell on this terrible day.

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Lucerne (City) Gletscher-garten

1913

Glacier garden, Lucerne

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